FPL

OCT 2 1 2002

L-2002-151
10 CFR 50.90
10 CFR 50.92

U. S. Nuclear Regulatory Commission
Attn.: Document Control Desk
Washington, D.C. 20555

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Proposed License Amendments
Reduction of Decay Time for Core Offload and
Revision of Technical Specification 3/4.9.3

In accordance with the provisions of 10 CFR 50.90, Florida Power and Light Company (FPL) requests that Appendix A of Facility Operating Licenses DPR-31 and DPR-41 for Turkey Point Units 3 and 4 be amended to: (1) reduce the minimum time required for reactor subcriticality prior to removing irradiated fuel from the reactor vessel from 100 hours to 72 hours, and (2) relocate this decay time requirement from the Turkey Point Units 3 and 4 Technical Specifications (TS) to the TS Bases document.

The proposed amendments delete Technical Specification 3/4.9.3, "Refueling Operations, Decay Time," in its entirety. The requirement will be documented in the TS Bases document. Additionally, the term "recently irradiated fuel" will be re-defined in the TS Bases as fuel that has occupied part of a critical reactor core within the previous 72 hours.

The proposed changes are based on reanalysis of the radiological consequences of a limiting design basis Fuel Handling Accident (FHA) using a 72 hour decay time, supported by a reanalysis of the spent fuel storage pool thermal hydraulic conditions with a higher average fuel assembly decay heat output.

The proposed changes are consistent with 10 CFR 50.36, "Technical Specifications," as amended July 19, 1995 (60 FR 36953), and NUREG-1431, "Standard Technical Specifications Westinghouse Plants," Revision 2, dated April 30, 2001.

A description and justification of the amendments request is provided in Enclosure 1. The no significant hazards determination and environmental impact analysis in support of the proposed technical specification changes are provided in Enclosures 2 and 3, respectively. Enclosure 4 provides the proposed marked up TS page. The proposed marked up TS Bases page is also included in that enclosure for information only. Enclosure 5 provides a clean copy of the proposed revised TS page. A clean copy of the revised TS Bases page is also included in that enclosure for information only. Enclosure 6 provides a list of the commitments made in this submittal. FPL has determined that the proposed license amendments do not involve a significant hazards consideration pursuant to 10 CFR 50.92.

A001

Approval of the requested change to the minimum time required for reactor subcriticality prior to removing irradiated fuel from the reactor vessel will allow Turkey Point to optimize refueling outage schedules based on improvements in reactor vessel disassembly procedures, cycle specific decay heat loads, available spent fuel pool cooling capability, and seasonal cooling canal temperatures. However, the administrative controls as well as the inherent delay associated with completing the required preparatory steps for moving fuel in the reactor vessel will ensure that the proposed 72-hour decay time will be met prior to removing irradiated fuel from the reactor vessel for a refueling outage.

The proposed license amendments are similar in nature to other NRC approved industry license amendments associated with decay time changes, such as for Entergy Operations, Inc. Arkansas Nuclear One – Unit 2, and First Energy Nuclear Operating Company, Beaver Valley Power Station – Units 1 and 2. In the case of Entergy Operations, Inc. Arkansas Nuclear One – Unit 2, a request for license amendment was submitted to relocate the minimum decay time requirement for fuel in the reactor vessel to a licensee controlled document. In the case of First Energy Nuclear Operating Company, Beaver Valley Power Station – Units 1 and 2, requests for license amendments were submitted to reduce the decay time from 150 hours to 100 hours.

The license amendments proposed by FPL have been reviewed by the Turkey Point Plant Nuclear Safety Committee and the FPL Company Nuclear Review Board. In accordance with 10 CFR 50.91(b)(1), a copy of these proposed license amendments is being forwarded to the State Designee for the State of Florida.

FPL requests that the proposed license amendments be approved by February 28, 2003, in support of the planned activities for the Unit 3 Cycle 20 refueling outage currently scheduled for March 1, 2003.

Should there be any questions on this request, please contact us.

Very truly yours,

J. P. McElwain
Vice President
Turkey Point Plant

Enclosures

cc: Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant
Florida Department of Health

STATE OF FLORIDA)
)ss.
COUNTY OF MIAMI-DADE)

J. P. McElwain being first duly sworn, deposes and says:

That he is Vice President, Turkey Point Plant, of Florida Power and Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Licensee.

J. P. McElwain

Subscribed and sworn to before me this

21 day of October, 2002.

Olga Hanek
Name of Notary Public (Type or Print)

Olga Hanek

J. P. McElwain is personally known to me.

OLGA HANEK
MY COMMISSION # CC 926970
EXPIRES. June 18, 2004
Bonded Thru Notary Public Underwriters

TABLE OF CONTENTS

Enclosures

ENCLOSURE 1

PROPOSED LICENSE AMENDMENTS APPLICATION

PROPOSED LICENSE AMENDMENTS APPLICATION

1.0 Description of Proposed Changes

Florida Power and Light Company (FPL) requests that Appendix A of Facility Operating Licenses DPR-31 and DPR-41 for Turkey Point Units 3 and 4 be amended to:

1) reduce the minimum time required for reactor subcriticality prior to removing irradiated fuel from the reactor vessel from 100 hours to 72 hours, and

2) relocate the associated decay time limitation from the Turkey Point Units 3 and 4 Technical Specifications (TS) to the TS Bases document.

The proposed change to the minimum decay time requirement from 100 hours to 72 hours is desired to provide additional flexibility in outage planning by allowing consideration of cycle specific decay heat loads, available spent fuel pool (SFP) cooling capability, and seasonal cooling canal temperatures in establishing the requisite core offload window. The relocation of the decay time requirement to the TS Bases document will make the Turkey Point Technical Specifications (TS) consistent with 10 CFR 50.36, "Technical Specifications," as amended July 19, 1995 (60 FR 36953), and NUREG-1431, "Standard Technical Specifications Westinghouse Plants," Revision 2, dated April 30, 2001. Consistent with NUREG-1431 and as part of the implementation of Amendments 216 and 210, approved by the NRC on September 27, 2001, the definition of "recently-irradiated fuel" was incorporated into the Turkey Point Units 3 and 4 TS Bases and defined as fuel that has occupied part of a critical reactor core within the previous 100 hours.

2.0 Justification for the Proposed Changes

2.1 Minimum Decay Time Reduction

The purpose of the decay time restriction before removing fuel from the reactor vessel is to ensure that the dose consequences of a fuel handling accident (FHA) remain below the values calculated in the plant safety analysis. Reducing the decay time from 100 hours to 72 hours will have an impact on the postulated fuel handling accident source term, since some of the short-lived fission products that were previously assumed to decay would be available for release. Reducing the decay time will also have an impact on the decay heat load that must be removed by the spent fuel pool (SFP) cooling system. The justification for the minimum decay time reduction addresses the impact on the following licensing and design bases:

- Impact of proposed amendments on radiological doses
- Impact of proposed amendments on SFP cooling
  - SFP bulk heat-up analysis
  - SFP local thermal-hydraulic analysis
  - Time-to-boil analysis
- Impact of proposed amendments on SFP structural integrity

2.1.1 Impact of Proposed Amendments on Radiological Doses

The NRC approved license Amendments 216 and 210 for Turkey Point Units 3 and 4, respectively, on September 27, 2001. These amendments revised TS 3.9.4, "Containment Building Penetrations," to allow the containment equipment hatch to be open under administrative controls during core alterations and movement of non-recently irradiated fuel assemblies (decay time greater than 100 hours) from the reactor pressure vessel. A revised radiological consequence analysis for the FHA was also reviewed and approved as part of the subject amendments. The revised analysis was based on the alternative source term (AST) methodology in Regulatory Guide (RG) 1.183 using conservative input parameters to maximize the fission product inventory. The results of that analysis are tabulated below.

Radiological Doses for Previously Approved FHA (100 hour decay)

Location	Calculated Dose (rem TEDE)	Regulatory Limit (rem TEDE)	Regulatory Margin (rem TEDE)
Site Boundary (EAB)	0.41	6.3	5.89
Control Room	1.41	5.0	3.59

The control room dose assessment in that submittal assumed 500 cfm unfiltered in-leakage.

The same AST methodology was used to re-analyze the radiological consequences of a FHA with a reduction in the assumed fuel assembly decay time from 100 hours to 72 hours. The results of that re-analysis are as follows:

Radiological Doses for Revised FHA (72 hour decay)

Location	Calculated Dose (rem TEDE)	Regulatory Limit (rem TEDE)	Regulatory Margin (rem TEDE)	Decrease in Reg. Margin (rem TEDE)
Site Boundary (EAB)	0.47	6.3	5.83	1.0%
Control Room	2.25	5.0	2.75	23.4%

As indicated in the above table, the radiological doses of a FHA after 72 hours of radioactive decay remain well within the limits of 10 CFR 50.67 and RG 1.183. Prior NRC approval of the revised radiological consequences analysis is required pursuant to 10 CFR 50.59, "Changes, Tests, and Experiments," as amended October 4, 1999 (64 FR 53582), since the change in dose to at least one group of receptors is considered to be more than minimal. As described in the amendment to 10 CFR 50.59, a change in dose consequences is considered to be more than minimal if the resulting increase is greater than 10 % of the difference between the existing dose value and the regulatory limit. Using this criterion, the proposed 28-hour reduction in required decay time results in a less than minimal increase in site boundary dose during a postulated FHA. The increase in control room dose is considered to be more than minimal based on the above criterion; and, therefore, prior NRC approval is sought.

The more than minimal increase in control room dose postulated for the revised FHA is due in part to a change in the amount of unfiltered in-leakage assumed for the control room envelope. The revised analysis described herein assumes 1000 cfm unfiltered in-leakage. This is a 100% increase in the amount of unfiltered in-leakage that is assumed in the current analysis. Additional analysis further confirms that control room dose would remain within the 10 CFR 50.67 regulatory limits, even if all of the control room ventilation system flow (18,000 cfm) was comprised of unfiltered outside air.

With the exception of decay time and control room unfiltered in-leakage rate, the revised radiological consequence analysis uses the same inputs and assumptions as those which were previously approved by the NRC under Amendments 216 and 210 for Turkey Point Units 3 and 4, respectively, on September 27, 2001.

Enclosure 2 demonstrates that the proposed increases in radiological dose during a FHA, due to a 28 hour reduction in fuel assembly decay time, does not involve a significant hazards consideration as defined in 10 CFR 50.92.

Occupational exposure to plant personnel working outside the SFP will not be significantly impacted by the reduced decay time of the spent fuel. Current refueling practice at Turkey Point avoids the placement of freshly discharged fuel assemblies along the east wall of the SFP, and the fuel transfer canal. This further limits dose rate in those areas of the plant that may be frequently accessed or occupied during an outage. Additionally, health physics barriers are erected in and around the plant near the fuel transfer tube to minimize personnel dose during spent fuel transit.

2.1.2 Impact of Proposed Amendments on SFP Cooling

There are two SFPs at Turkey Point, one for each unit. Each storage pool is provided with a dedicated cooling system. Each SFP cooling system consists of a pump, heat exchanger, filter, demineralizer, piping and associated valves and instrumentation. The pump draws water from the pool, circulates it through the heat exchanger, and returns it to the pool. Component cooling water (CCW) cools the heat exchanger. A 100-percent-capacity spare pump is also permanently piped into the SFP cooling system. Both SFP cooling pumps are powered from the same breaker via a transfer switch. Thus, this spare pump is capable of operating in place of the main pump, but not in parallel with it.

The SFP cooling systems at Turkey Point are not safety grade systems. However, they are seismically qualified and will remain functional during and after a safe shutdown earthquake. Essential SFP cooling equipment is also enclosed within a reinforced concrete structure. The doorway into the SFP cooling building is secured with heavy metal grating to restrict personnel access.

The water level in the SFPs is maintained in accordance with TS 3/4.9.11, "Refueling Operations, Water Level – Storage Pool." Makeup to the SFPs to maintain this level can be provided from a variety of sources. The credited makeup source for the SFPs is 100 gpm from the demineralized water system. In the event that the demineralized water system is not available, alternate makeup can be provided via the seismic Category I refueling water storage tank, or via temporary (non-Category I) connections from the fire water system or primary water storage tank.

Reducing the decay time from 100 hours to 72 hours will also have an impact on the decay heat load that must be removed by the SFP cooling system. The following sections discuss the effect of this change on SFP bulk temperature, thermal-hydraulic analysis, and time-to-boil analysis.

2.1.2.1 SFP Bulk Heat-Up Analysis and Administrative Controls

2.1.2.1.1 Analysis

The current decay heat calculations of record are described in Turkey Point Updated Final Safety Analysis Report (UFSAR) Appendix 14D, Section 3.2. Originally prepared to describe the supporting analysis for installation of high-density storage racks, the analysis was updated to reflect thermal power uprate and 24-month fuel cycle assumptions. Subsequently revised pursuant to 10 CFR 50.59 requirements, the UFSAR currently reflects analyses supporting full core offload and moving irradiated fuel in the reactor vessel as early as 108 hours after reactor shutdown for a typical 18-month refueling cycle.

The proposed amendments to allow moving irradiated fuel 72 hours after shutdown require updated supporting decay heat calculations. The UFSAR currently addresses four different SFP heat-up cases derived from the Standard Review Plan (SRP). These cases address maximum *normal* and maximum *abnormal* heat load conditions. The maximum normal heat load is based on a 1/2 core offload consistent with FPL plans at the time for a 24-month refueling cycle. The maximum abnormal cases are based on a full core offload that occurs 36 days after a previous normal refueling. In support of the requested amendments for a reduced decay time, FPL has redefined the SRP cases to reflect the planned refueling practice of full core offloads. The abnormal case is now interpreted to be an unplanned or emergency offload case. The SRP assumption of a 36 day post refueling core offload is retained in the updated analysis scenarios.

In keeping with the above, a planned refueling would offload the entire core (157 fuel assemblies) beginning at 72 hours. The postulated unplanned, forced shutdown scenario would also offload the entire core beginning at 72 hours. The forced offload is assumed to begin 36 days after a previous reactor shutdown for a planned refueling. The analysis assumed offload capacity in the SFP includes an added (future) spent fuel storage rack in the cask loading area of the pool and that all other storage cells are filled with previously discharged fuel, including the 1/3 core recently offloaded. The analysis for these cases and results are described below.

Case 1: Planned Refueling
Full core offload initiated at 72 hours after shutdown

Case 2: Planned Operation
1/3 core offload with full capacity inventory at 36 days after shutdown

Case 3: Unplanned Operation with Spent Fuel Pool Cooling
Full core offload at 72 hours following a forced shutdown with 1/3 core recently offloaded (36 days after a planned refueling shutdown)

Case 4: Unplanned Operation without Spent Fuel Pool Cooling
Full core offload at 72 hours following a forced shutdown with 1/3 core recently offloaded (36 days after a planned refueling shutdown) with loss of SFP cooling at bulk peak pool water temperature (time to boiling begins at bulk peak pool water temperature)

The planned refueling (Case 1) is evaluated at two different CCW temperatures. A low CCW temperature of 85 °F is analyzed as Case 1a with a high fuel transfer rate of 8 fuel assemblies per hour. A second case is analyzed with CCW at its maximum temperature of 105 °F. This latter case is designated Case 1b below and is analyzed with a fuel transfer rate of 6 fuel assemblies per hour. These two cases demonstrate the capability of the SFP cooling system at various CCW temperatures.

The following input parameters were used in the analysis:

Input Parameter	Value
Full Core Decay Heat Load	30.5 MBtu/hr at 72 hours 12.3 MBtu/hr at 36 days
Full Capacity (past refuelings) SFP Heat Load	3.82 MBtu/hr
CCW Inlet Temperature Case 1a Cases 1b, 2, 3, and 4	 85 °F 105 °F
CCW Flow Rate	2800 gpm (minimum)
SFP Cooling Flow Rate	2200 gpm (minimum)
Heat Exchanger Fouling	0.000075 hr-ft^2-°F/Btu
Heat Exchanger Tube Plugging Allowance	0%
Fuel Assembly Transfer Rate Case 1a Case 1b	 8 per hour 6 per hour
SFP Water Inventory	2,033,099 lbm
SFP Water Make-Up Rate	100 gpm
Capacity of Existing Racks	1404 Fuel Assemblies
Allowance for Potential Future Rack Addition	132 Fuel Assemblies

The analysis uses the same methodology and assumptions for heat exchanger performance as those used to support thermal power uprate (performed in 1996 under license Amendments 191 and 185 for Units 3 and 4, respectively).

Heat exchanger effectiveness was quantified in 1996 to support the SFP cooling analyses at uprated conditions. Heat exchanger effectiveness was calculated using plant data obtained from the 1993 and 1994 Unit 4 refueling outages, and an empirically derived fouling factor of 0.000075 hr-ft^2-°F/Btu. The use of this fouling factor (in lieu of the design fouling factor used by the heat exchanger manufacturer for sizing purposes) is justified by the fact that tube side SFP water is continuously purified and slightly acidic and the shell side water is treated CCW. Data collected during the recent 2002 Unit 4 refueling outage confirmed that there has been no observable change in heat exchanger performance compared to 1993/1994 data.

Minimum tube and shell side flow rates have been assumed in the analysis to conservatively model SFP heat exchanger performance. The assumed flow rates are 10% lower than the operating flowrates during a refueling outage. This provides additional conservatism to account for potential future heat exchanger degradation, (e.g., fouling, tube plugging). No tube plugging is assumed in the heat-up analysis since no tubes are currently plugged (after 30 years of heat exchanger operation).

The decay heat values in the updated analysis were determined from the ORIGEN-2 computer code using historic and projected burnup schedules for Units 3 and 4. The 1/3 core is assumed to be 64 assemblies to bound one reload batch.

Acceptance criteria for the SFP bulk heat-up analysis:

a. The bulk maximum SFP temperature shall remain below 150 °F from a full core offload during a planned refueling.

b. The bulk maximum SFP temperature shall remain below 212 °F during an unplanned offload evolution.

The 150 °F acceptance criterion specified above for planned refuelings was established for the SFP cooling systems as part of the thermal power uprate. The 150 °F value was based on a review of other plants' licensing requirements, and the first re-racking at Turkey Point (performed in 1977 under license Amendments 23 and 22 for Units 3 and 4, respectively). It was applied during the analysis of the Turkey Point Unit 4, Cycle 16 (pre-uprate) full core offload. Accordingly, the 150 °F temperature limitation represents a reasonable criterion for both partial and full core offloads for both Turkey Point SFPs.

The 212 °F acceptance criterion specified for unplanned offloads is representative of bulk SFP boiling conditions.

Results of the SFP bulk heat-up analysis:

Case 1: Planned Refueling

1a. The maximum expected SFP bulk temperature for a full core offload at 72 hours after shutdown is 147 °F with a CCW inlet temperature of 85 °F, and a transfer rate of 8 fuel assemblies per hour.

1b. The maximum expected SFP bulk temperature for a full core offload at 72 hours after shutdown is 165 °F with a CCW inlet temperature of 105 °F, and a transfer rate of 6 fuel assemblies per hour.

Case 2: Planned Operation

The maximum expected SFP bulk temperature for a 1/3 core offload with capacity inventory at 36 days after shutdown is 121 °F.

Case 3: Unplanned Operation with Spent Fuel Pool Cooling

The maximum expected SFP bulk temperature for a full core offload at 72 hours following a forced shutdown (36 days after a planned refueling shutdown) with 1/3 core recently offloaded is 183 °F. This temperature assumes that the entire core is offloaded as a complete unit at 72 hours. The time to reach this maximum steady-state temperature with SFP cooling is 25 hours after offload.

Case 4: Unplanned Operation without Spent Fuel Pool Cooling

The maximum expected SFP bulk temperature for a full core offload at 72 hours following a forced shutdown (36 days after a planned refueling shutdown) with 1/3 core recently offloaded, with a subsequent loss of cooling, is 212 °F. If SFP cooling were lost at the time of the peak pool temperature (183 °F), the pool would reach boiling conditions in 1.5 hours.

Decay heat analysis results for the above cases are similar to, or bounded by, those currently described in UFSAR Appendix 14D Section 3.2.

A comparison between the current analysis and the new analysis for a planned refueling is provided below.

Current and New Heat-up Analysis Results – Planned Refueling

Analysis	CCW Temperature	Peak SFP Temperature
Current UFSAR Case	100 °F	155 °F
UFSAR Case at Elevated CCW Temp.	105 °F	160 °F
72-Hour Offload Case 1a	85°F	147 °F
72-Hour Offload Case 1b	105 °F	165 °F

As shown above, the current analysis for a planned refueling predicts peak SFP temperatures > 150 °F for a full core offload. Administrative controls are currently credited to maintain pool peak temperature below 150 °F. The new analysis similarly predicts that the bulk SFP temperature would overshoot 150 °F under some offload scenarios (e.g., Case 1b) such that administrative controls will continue to be relied upon to maintain pool temperature below that value.

2.1.2.1.2 Administrative Controls

Administrative controls are proceduralized to suspend offload activities at a lower SFP temperature to maintain pool peak temperature below 150 °F.

The administrative controls described in this submittal will be implemented by the TS Bases document and various plant procedures as illustrated below:

TS Bases Document

The TS Bases document will prohibit fuel movement in the reactor vessel from occurring before the 72-hour decay time has elapsed. This operating restriction, coupled with the inherent delay associated with completing the required preparatory steps for moving fuel in the reactor vessel will ensure that the proposed 72-hour decay time will be met for each refueling outage.

Procedural Controls

Plant procedures will control the allowable offload start time, fuel assembly offload rate and administrative SFP bulk temperature limit required to maintain pool temperature below 150 °F. As indicated previously, Turkey Point currently uses administrative controls to ensure SFP bulk water temperature does not exceed 150 °F during planned refuelings. The requisite controls include minimum offload start time, maximum SFP bulk temperature and maximum fuel assembly transfer rate. These controls are already incorporated into the plant procedures that govern reactor refueling so plant operators are already accustomed to the practice.

The proposed offload schedule evaluated herein is also affected by CCW temperature. This variable, along with offload start time and fuel assembly transfer rate, affects the SFP heat-up rate and the peak water temperature. To address this process variable, the plant operating procedure controlling minimum start time and maximum fuel assembly transfer rate will be revised to relate these parameters to CCW temperature required to maintain SFP temperature below the 150 °F limit. An administrative bulk pool temperature limit will continue to be imposed to ensure that the 150 °F limit is not exceeded after completion of offload activities due to the inherent lag in SFP heat-up. The specified administrative limit will maintain SFP temperature below 150 °F without intervening operator action. Bounding values will be provided in the procedures with an option to obtain cycle-specific values from engineering prior to commencing offload activities.

Due to the many variables that can have an impact on SFP temperature, FPL may elect to use a cycle-specific offload start time and fuel assembly offload rate in lieu of the bounding restrictions. Consideration will be given to the actual core power history, scheduled off load start time, actual CCW temperature, predicted SFP heat exchanger performance, and planned fuel assembly off load rate in the establishment of the specific control values.

Regardless of whether cycle-specific or bounding offload parameters are used for a particular refueling, plant procedures will require that fuel transfer to the SFP be suspended if the administrative temperature limit is reached during the offload. Resumption of offload activities would occur when the bulk temperature decreases below the administrative limit. Note that FPL may elect to perform a partial in-core shuffle in conjunction with administrative temperature controls, to complete a planned offload without interruption and maintain bulk SFP water temperature below 150 °F.

Various methods are available to monitor the bulk SFP pool water temperature during an offload. It is monitored locally by Operators in the SFP. An annunciator panel alarm also exists and will alert Operators in the control room of pending high SFP water temperature conditions.

2.1.2.2 SFP Local Thermal-Hydraulic Analysis

The current thermal-hydraulic analysis of record is described in Turkey Point UFSAR Appendix 14D, Section 3.3. This analysis was performed in support of the currently installed high-density storage racks. A new analysis was performed to determine if the water in the storage racks will remain subcooled given the increased decay heat associated with 72-hour offload conditions.

Acceptance criteria for the SFP local thermal-hydraulic analysis:

a. The local maximum SFP temperature shall remain below the local saturation temperature of the water.

b. The maximum fuel cladding temperature in the SFP shall remain below the local saturation temperature of the water. If the maximum fuel cladding temperature exceeds the local saturation temperature of the water, a departure from nucleate boiling shall not occur.

In the SFP storage rack cells, decay heat from the fuel induces a natural circulation of water upward through the fuel assembly. Cooler water is supplied to the bottom of the rack cells through various flow holes. Water gaps or plenums between the racks and the SFP floor and walls allow water from the area above the rack to flow to the inlet of the rack cells.

Fluid flows and temperatures within a rack cell loaded with fuel having a 72-hour decay time were determined by rigorous computational fluid dynamics (CFD) analysis. The CFD analysis was performed using the FLUENT™ fluid flow and heat transfer modeling program. A single bounding case was evaluated that includes the highest bulk SFP temperature (150 °F) and decay heat load, and conservative hydraulic parameters.

Key assumptions of the SFP local thermal-hydraulic analysis include:

- No downcomer flow exists between the individual storage rack modules.
- The hydraulic resistance of every rack cell in the SFP includes the hydraulic resistance that would result from a dropped fuel assembly lying across the top of the rack.
- A fouling factor of 0.0005 hr-ft^2-°F/Btu is imposed on the outside of the fuel rods to account for any crud layer.
- The maximum local water temperature (at the fuel rack exit) and peak fuel assembly heat flux (typically near the mid-height of the active fuel) occur coincidentally.
- The radial peaking factor is applied to the hottest batch decay heat generation rate to account for variations in heat emission within the batch.
- The rack cell inlet temperature is equal to the SFP bulk temperature of 150 °F.

Results of the SFP local thermal-hydraulic analysis:

Results Parameter	Value
Peak Local Water Temperature	192 °F
Peak Fuel Cladding Temperature	236 °F

The saturation temperature of water in the SFP increases with increasing depth (pressure). The critical location for localized boiling in the fuel racks is at the top of the active fuel height. The minimum depth of water at the top of the active fuel height is 25.75 feet. At this water depth, the saturation temperature of water is 241 °F. Both the calculated peak local water temperature and the peak fuel cladding temperature are below the local saturation temperature.

2.1.2.3 Time-To-Boil Analysis

The current time-to-boil analysis of record is described in Turkey Point UFSAR Appendix 14D, Section 3.2. That analysis is based on a full core offload at 150 hours following a forced shutdown with 1/2 core recently offloaded to the pool (36 days after a normal refueling shutdown) – consistent with 24-month fuel cycle assumptions. A time-to-boil of approximately 1 hour was calculated for that case based on the assumption that SFP cooling is lost at the time of peak pool temperature (194.5 °F). The maximum boil-off (make-up) rate at 212 °F for that case was 76.3 gpm.

An updated time-to-boil analysis is required to support 72-hour offload conditions. The acceptance criteria for this analysis is:

a. The time to heat the SFP to 212 °F after loss of SFP cooling during an unplanned offload evolution shall be sufficient to permit alignment of available make-up sources.

b. The required make-up rate to replace water due to boiling shall be less than the existing rate of 100 gpm.

The supporting analysis determines the time-to-boil for a full core offload at 72 hours following forced shutdown (36 days after a planned refueling shutdown) with 1/3 core recently offloaded – consistent with the current 18-month fuel cycles. The time-to-boil is 1.5 hours assuming that SFP cooling is lost at the time of the peak pool temperature (183 °F). The maximum boil-off (make-up) at 212 °F for this condition is 81 gpm. This make-up rate is within the 100 gpm acceptance criteria established for the SFP bulk heat-up analysis.

Makeup rates from available unborated water sources to the SFP have previously been submitted to the NRC in Attachment 6 to FPL letter L-99-176 in support of Amendments 206 and 200 for Turkey Point Units 3 and 4, respectively. As documented in L-99-176, the following makeup sources satisfy the 100 gpm acceptance criterion.

Estimated SFP Makeup Rates from Unborated Water Sources

Makeup Source	Rate (gpm)
Demineralized Water System	174
Primary Water System	
Direct Connection	415
Local Hose Station	500
Fire Hose Station Outside SFP	100

Additionally, the SFP makeup rate from the borated RWST is 100 gpm.

Several factors account for the increase in time-to-boil calculated for the 72-hour offload condition. These factors include lower bulk peak temperature (183 °F versus 194.5 °F), use of representative refueling practices (1/3 core discharged versus 1/2 core), and heat exchanger performance derived from actual plant data (consistent with that assumed in the SFP bulk heat-up analysis). When the current UFSAR case (a full core offload at 150 hours following a forced shutdown with 1/2 core recently offloaded to the pool 36 days after a normal refueling shutdown), is analyzed with equivalent heat exchanger performance assumptions, the time-to-boil is increased from 1 hour to approximately 2 hours. When this supplemental time-to-boil value is compared to that determined for 72-hour offload conditions (1/3 core and decay heat based on ORIGEN-2 code), the time to boil will decrease to 1.5 hours. The 1.5 hour time-to-boil calculated for the 72 hour offload conditions provides sufficient time to establish makeup to the SFP.

The time-to-boil analysis assumptions are sufficiently conservative such that actual times to reach boiling conditions in the SFP will be longer than those documented herein. For example, the analysis assumes that the entire core is off loaded to the SFP in one complete step at 72 hours after shutdown. No credit is taken for the time dependent nature of the offload activities which can span 26 hours for a full core offload at a rate of 6 assemblies per hour. The CCW system is also assumed to be at its maximum temperature of 105 °F.

2.1.3 Impact of Proposed Amendments on SFP Structural Integrity

The proposed amendments do not require a change to the SFP structural analyses. As described in UFSAR Appendix 14D Subsection 3.2.2, the SFP has been structurally analyzed and can withstand the stresses associated with a steady-state thermal gradient of 150 °F. This 150 °F temperature gradient is based on a pool water temperature of 180 °F and a 30 °F outside air temperature. Additional structural analyses have been performed on the pool for a temperature gradient reflecting 212 °F water temperature and a 30 °F outside air temperature. The existing analyses conservatively assume that thermal equilibrium is reached such that the results are independent of time. Thus, the current analyses bound any increase in duration that the pool may operate at or near 150 °F under 72-hour offload conditions.

Given that the analyses account for a steady-state temperature of 180 °F, an accident temperature of 212 °F, and the American Concrete Institute ACI-349-97, "Code Requirements for Nuclear Safety Related Concrete Structures," indicates temperatures of up to 350 °F can be tolerated for short term periods with no appreciable impact on concrete strength, there are no structural issues associated with the proposed amendments.

As such, the existing analyses bound conditions associated with a reactor vessel fuel offload beginning 72-hours after shutdown.

2.2 Technical Justification for the Proposed TS Change

The proposed amendments delete Technical Specification 3/4.9.3, "Refueling Operations, Decay Time," in its entirety. The proposed change is consistent with 10 CFR 50.36, "Technical Specifications," as amended July 19, 1995 (60 FR 36953), and NUREG-1431, "Standard Technical Specifications Westinghouse Plants," Revision 2, dated April 30, 2001. Consistent with NUREG-1431 and as part of the implementation of Amendments 216 and 210, approved by the NRC on September 27, 2001, the definition of "recently-irradiated fuel" was incorporated into the Turkey Point Units 3 and 4 TS Bases and defined as fuel that has occupied part of a critical reactor core within the previous 100 hours. Therefore, the proposed change is a conforming change in that it deletes the decay time limitation already included in the Turkey Point Units 3 and 4 Bases.
A description and justification for the proposed change is provided below:

TS 3/4.9.3 - Refueling Operations, Decay Time

The proposed change deletes this TS in its entirety and relocates the Limiting Condition for Operation (LCO), associated action, and surveillance requirement to the TS Bases.

The proposed change is justified by the criteria of 10 CFR 50.36, "Technical Specifications." The following four criteria described in 10 CFR 50.36(c)(2)(ii) delineate the requirements for including a LCO in the TS:

Criterion 1 – Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.

The movement of irradiated fuel into the SFP does not involve a reactor coolant pressure boundary or control room instrumentation that is used to detect a significant degradation of the reactor coolant pressure boundary. Therefore, TS 3/4.9.3 does not fall within or satisfy this criterion.

Criterion 2 – A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

The FHA is the related design basis accident and inherently postulates a radiological release from a dropped fuel assembly during refueling. The decay time assumption in the FHA analysis defines the nature of the radiological products released from the breached fuel rods. TS 3/4.9.3 restricts movement of fuel until the requisite decay time assumed in the FHA analysis has elapsed. The FHA does not assume any further delay in fuel movement beyond the initial hold time. Since the administrative controls as well as the inherent delay associated with completing the required preparatory steps for moving fuel in the reactor vessel will ensure that the proposed 72-hour decay time will be met for a refueling outage, this TS is not needed to uphold the FHA analysis assumption. During the development of NUREG-1431, the industry/NRC agreed that this LCO could be relocated to a licensee controlled document, since it is not required to be in TS to provide adequate protection of the health and safety of the public. Hence, this specification should be relocated to the TS Bases document, consistent with NUREG-1431.

Criterion 3 – A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

The specified decay time ensures that sufficient time has elapsed to comply with the source term assumptions of the FHA prior to transferring fuel from the reactor pressure vessel to the spent fuel storage pool. The specified decay time also ensures that the temperature limits of the SFP are not exceeded during a refueling outage. The transfer of fuel to the SFP does not provide a primary success path in accident mitigation. Therefore, TS 3/4.9.3 does not fall within or satisfy this criterion.

Criterion 4 – A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to the public safety.

The minimum decay time requirement will continue to ensure that, if a FHA were to occur, any radiological release would remain below 10 CFR 50.67 and RG 1.183 limits. Public health and safety is not affected by the timing of the fuel movement after the 72-hour decay time has elapsed. The SFP heat load associated with a 72-hour decay time has also been shown not to be significant to public health and safety. Therefore, TS 3/4.9.3 does not fall within or satisfy this criterion.

The above evaluation demonstrates that the TS for decay time does not fall within or satisfy the above criteria for retention in the TS. Hence, the decay time requirement is to be relocated to the TS Bases document. Changes to the TS Bases document are subject to the criteria of 10 CFR 50.59. Additionally, administrative changes to the TS Bases document are controlled by a site procedure. Given these controls, the TS Bases document is considered an appropriate document to administer the decay time requirement.

3.0 Conclusion

The proposed license amendments reduce the minimum time required for reactor subcriticality before moving irradiated fuel in the reactor vessel from 100 hours to 72 hours, and relocate the associated decay time limitation from the TS to the TS Bases document. The proposed offload start time change has been evaluated for potential radiological, thermal-hydraulic and structural integrity impact using conservative analysis techniques. The analyses determined that results are either bounded by existing analyses or, if not bounded, then remain within acceptance criteria as previously described in the Turkey Point Units 3 and 4 UFSAR. The proposal to relocate the decay time limitation to the TS Bases document is justified because it does not fall within or satisfy requirements for including limiting conditions for operation in technical specifications pursuant to 10 CFR 50.36(c)(2)(ii).

ENCLOSURE 2

NO SIGNIFICANT HAZARDS CONSIDERATIONS

NO SIGNIFICANT HAZARDS CONSIDERATIONS

Introduction

Florida Power and Light Company (FPL) requests that Appendix A of Facility Operating Licenses DPR-31 and DPR-41 for Turkey Point Units 3 and 4 be amended to:

1) reduce the minimum time required for reactor subcriticality prior to removing irradiated fuel from the reactor vessel from 100 hours to 72 hours, and

2) relocate the associated decay time limitation from the Turkey Point Units 3 and 4 Technical Specifications (TS) to the TS Bases document.

The proposed change to the minimum decay time requirement from 100 hours to 72 hours is desired to provide additional flexibility in outage planning by allowing consideration of cycle specific decay heat loads, available spent fuel pool (SFP) cooling capability, and seasonal cooling canal temperatures in establishing the requisite core offload window. The relocation of the decay time requirement to the TS Bases document will make the Turkey Point Technical Specifications (TS) consistent with 10 CFR 50.36, "Technical Specifications," as amended July 19, 1995 (60 FR 36953), and NUREG-1431, "Standard Technical Specifications Westinghouse Plants," Revision 2, dated April 30, 2001. Consistent with NUREG-1431 and as part of the implementation of Amendments 216 and 210, approved by the NRC on September 27, 2001, the definition of "recently-irradiated fuel" was incorporated into the Turkey Point Units 3 and 4 TS Bases and defined as fuel that has occupied part of a critical reactor core within the previous 100 hours.

No Significant Hazards Considerations

The Commission has provided standards for determining whether a significant hazards consideration exists as stated in 10 CFR 50.92. A proposed amendment to an operating license for a facility involves no significant hazards consideration if operation of the facility in accordance with a proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. A discussion of these standards as they relate to this change request follows.

1. Will operation of the facility in accordance with this proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   No. The accident of concern related to the proposed change is the fuel handling accident (FHA). This accident assumes a dropped fuel assembly. One of the assumptions made in the analysis is that fuel movement is delayed for some time period after shutdown to accommodate cooldown of the reactor coolant system and disassembly of the reactor pressure vessel. This delay period allows for radioactive decay of the in-reactor vessel fission product inventory. Reducing the analyzed decay time from 100 hours to 72 hours does not increase the probability of a FHA because the timing of fuel movement in the reactor pressure vessel does not alter the manner in which fuel assemblies are handled.

   Reducing the analyzed decay time from 100 hours to 72 hours does increase the offsite dose and control room dose projections of a FHA above those previously reviewed and approved by the NRC for Turkey Point Units 3 and 4 per Amendments 216 and 210. However, it has been shown by reanalysis of such an accident involving irradiated fuel with at least 72 hours of decay that the projected doses remain well within applicable regulatory limits. Hence, the proposed change in timing of fuel movement in the reactor pressure vessel does not involve a significant increase in the consequences of a FHA.

   Additionally, the manner in which the minimum in-reactor vessel decay time is controlled will not impact the probability of occurrence, or the consequences of a FHA. Relocating the decay time requirement from the TS to the TS Bases document and other administrative controls will continue to ensure that this key accident analysis assumption is upheld. The inherent delay associated with completing the required preparatory steps for moving fuel in the reactor vessel further ensures that the proposed 72-hour decay time will be met for a refueling outage.

   Therefore, operation of the facility in accordance with the proposed amendments would not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Will operation of the facility in accordance with this proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   No. The impact of the proposed change is limited to fuel handling operations and spent fuel pool cooling. No physical plant changes are proposed to accommodate the timing change for fuel movement. Hence, no new failure modes are created that would cause a new or different kind of accident from any accident previously evaluated. The supporting analysis for the timing change demonstrates that the associated increase in decay heat load will not cause any spent fuel pool (SFP) component or structure to operate outside design limits. Adequate margins to safety are maintained with respect to SFP water temperature and structural loading.

Additionally, the manner which the minimum in-reactor vessel decay time is controlled will not impact the operation of any structure, system, or component.

Therefore, operation of the facility in accordance with the proposed amendments would not create the possibility of a new or different kind of accident from any previously evaluated.

3. Will operation of the facility in accordance with this proposed change involve a significant reduction in a margin of safety?

   No. The proposed change in plant operation does not significantly reduce the margin of safety. It has been shown by reanalysis of a FHA involving irradiated fuel with at least 72 hours of decay that the projected doses will be well within applicable regulatory limits. Additionally, it has been shown by thermal hydraulic analysis that operation of the SFP cooling system in accordance with the restrictions and limitations identified in the amendments application will maintain adequate margins to pool boiling. Analysis of transient SFP concrete temperatures similarly demonstrates that the integrity of the pool structure will not be compromised if the amount of in-reactor vessel fuel assembly decay time is reduced from 100 hours to 72 hours.

   The proposed change in the manner in which the minimum in-reactor vessel decay time will be controlled will not impact plant safety. Relocating the decay time requirement from the TS to the TS Bases document and other administrative controls will continue to ensure that this key accident analysis assumption is upheld. The inherent delay associated with completing the required preparatory steps for moving fuel in the reactor vessel further ensures that the proposed 72-hour decay time will be met for a refueling outage.

   Therefore, operation of the facility in accordance with the proposed amendments does not involve a significant reduction in the margin of safety.

Based on the reasoning presented above, FPL has determined that the requested changes involve no significant hazards consideration.

<u>ENCLOSURE 3</u>

ENVIRONMENTAL CONSIDERATION

ENVIRONMENTAL CONSIDERATION

The proposed license amendments change requirements with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The proposed amendments involve no significant increase in the amounts and no significant increase in the types of any effluents that may be released off site, and no significant increase in individual or cumulative occupational radiation exposure. FPL has concluded that the proposed amendments involve no significant hazards consideration and therefore, meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Hence, pursuant to 10 CFR 51.22(b), an environmental impact statement or environmental assessment need not be prepared in connection with issuance of the amendments.

ENCLOSURE 4

PROPOSED MARK-UP OF AFFECTED TECHNICAL SPECIFICATION AND BASES PAGES

TECHNICAL SPECIFICATION PAGE 3/ 4 9-3

BASES PAGE B 3/ 4 9-1 (FOR INFORMATION ONLY)

REFUELING OPERATIONS

3/4.9.3 DECAY TIME

~~LIMITING CONDITION FOR OPERATION~~

~~3.9.3 The reactor shall be subcritical for at least 100 hours.~~

~~APPLICABILITY: During movement of irradiated fuel in the reactor vessel.~~

~~ACTION:~~

~~With the reactor subcritical for less than 100 hours, suspend all operations involving movement of irradiated fuel in the reactor vessel.~~

DELETED

~~SURVEILLANCE REQUIREMENTS~~

~~4.9.3 The reactor shall be determined to have been subcritical for at least 100 hours by verification of the date and time of subcriticality prior to movement of irradiated fuel in the reactor vessel.~~

For Information Only

3/4.9 REFUELING OPERATIONS
BASES
3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: (1) the reactor will remain subcritical during CORE ALTERATIONS, and (2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the safety analyses. With the required valves closed during refueling operations the possibility of uncontrolled boron dilution of the filled portion of the RCS is precluded. This action prevents flow to the RCS of unborated water by closing flow paths from sources of unborated water. The boration rate requirement of 16 gpm of 3.0 wt% (5245 ppm) boron or equivalent ensures the capability to restore the SHUTDOWN MARGIN with one OPERABLE charging pump.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the Source Range Neutron Flux Monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core. There are four source range neutron flux channels, two primary and two backup. All four channels have visual and alarm indication in the control room and interface with the containment evacuation alarm system. The primary source range neutron flux channels can also generate reactor trip signals and provide audible indication of the count rate in the control room and containment. At least one primary source range neutron flux channel to provide the required audible indication, in addition to its other functions, and one of the three remaining source range channels shall be OPERABLE to satisfy the LCO.

3/4.9.3 DECAY TIME **DELETED**
~~The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor vessel ensures that sufficient time has elapsed to allow the radioactive decay of short-lived fission products. This decay time is consistent with the assumptions used in the safety analyses, and ensures that the release of fission product radioactivity, subsequent to a fuel handling accident, results in doses that are well within the values specified in 10 CFR 50.67 and RG 1.183.~~

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

This TS is applicable during movement of recently irradiated fuel assemblies within containment. Recently irradiated fuel is defined as fuel that has occupied part of a critical reactor core within the previous 72 hours. However, Amendments _____ and _____ for Turkey Point Units 3 and 4 prohibit the movement of irradiated fuel until the 72-hour decay time assumption of the fuel handling accident (FHA) is satisfied. The FHA is a postulated event that involves damage to irradiated fuel. The in-containment FHA involves dropping a single irradiated fuel assembly, resulting in damage to a single fuel assembly. The 72-hour required decay time before moving fuel in containment ensures that sufficient time has elapsed to allow the radioactive decay of short-lived fission products. This decay time is consistent with the assumptions used in the safety analyses, and ensures that the release of fission product radioactivity, subsequent to a fuel handling accident, results in doses that are well within the values specified in 10 CFR 50.67 and RG 1.183.
~~During movement of recently irradiated fuel assemblies within containment, the most severe radiological consequences result from a fuel handling accident (FHA). The FHA is a postulated event that involves damage to irradiated fuel. The in-containment FHA involves dropping a single irradiated fuel assembly, resulting in damage to a single fuel assembly. Recently irradiated fuel is defined as fuel that has occupied part of a critical reactor core within the previous 100 hours.~~

ENCLOSURE 5

PROPOSED CLEAN COPY OF
TECHNICAL SPECIFICATION AND BASES PAGES

TECHNICAL SPECIFICATION PAGE 3/ 4 9-3

BASES PAGE B 3/ 4 9-1 (FOR INFORMATION ONLY)

3/4.9.3 DECAY TIME

DELETED

3/4.9 REFUELING OPERATIONS

BASES

3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: (1) the reactor will remain subcritical during CORE ALTERATIONS, and (2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the safety analyses. With the required valves closed during refueling operations the possibility of uncontrolled boron dilution of the filled portion of the RCS is precluded. This action prevents flow to the RCS of unborated water by closing flow paths from sources of unborated water. The boration rate requirement of 16 gpm of 3.0 wt% (5245 ppm) boron or equivalent ensures the capability to restore the SHUTDOWN MARGIN with one OPERABLE charging pump.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the Source Range Neutron Flux Monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core. There are four source range neutron flux channels, two primary and two backup. All four channels have visual and alarm indication in the control room and interface with the containment evacuation alarm system. The primary source range neutron flux channels can also generate reactor trip signals and provide audible indication of the count rate in the control room and containment. At least one primary source range neutron flux channel to provide the required audible indication, in addition to its other functions, and one of the three remaining source range channels shall be OPERABLE to satisfy the LCO.

3/4.9.3 DECAY TIME DELETED

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

This TS is applicable during movement of recently irradiated fuel assemblies within containment. Recently irradiated fuel is defined as fuel that has occupied part of a critical reactor core within the previous 72 hours. However, Amendments _____ and _____ for Turkey Point Units 3 and 4 prohibit the movement of irradiated fuel until the 72-hour decay time assumption of the fuel handling accident (FHA) is satisfied. The FHA is a postulated event that involves damage to irradiated fuel. The in-containment FHA involves dropping a single irradiated fuel assembly, resulting in damage to a single fuel assembly. The 72-hour required decay time before moving fuel in containment ensures that sufficient time has elapsed to allow the radioactive decay of short-lived fission products. This decay time is consistent with the assumptions used in the safety analyses, and ensures that the release of fission product radioactivity, subsequent to a fuel handling accident, results in doses that are well within the values specified in 10 CFR 50.67 and RG 1.183.

ENCLOSURE 6

LIST OF REGULATORY COMMITMENTS

LIST OF REGULATORY COMMITMENTS

The following table identifies those actions committed to by FPL in this submittal. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments. Please direct questions regarding these commitments to Walter J. Parker, Licensing Manager, Turkey Point Units 3 and 4.

Regulatory Commitment	Due Date
Revise plant documents to specify that the minimum time for reactor subcriticality prior to moving irradiated fuel from the reactor vessel will be 72 hours.	Within 60 days of NRC approval of the Amendments
FPL will maintain administrative controls to ensure SFP bulk water temperature does not exceed 150 °F during a planned refueling.	Complete